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ILLEGAL ALIENS, UNEMPLOYMENT  
AND IMMIGRATION POLICY

by

Slobodan Djajić\*†  
Queen's University

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Abstract

This paper develops a simple two-country model of illegal immigration in an attempt to examine the interaction among variables such as the stock of migrant labor, the unemployment rates of the two economies, and the rate of spending by the host country on the enforcement of its immigration restrictions. The focus of the analysis is on the dynamics of immigration policy and on its role in determining the nature of the mechanism by which disturbances to the labor market of one economy are transmitted to that of the other in the short run and in the long run.

† Assistant Professor, Department of Economics, Queen's University, Kingston, Canada K7L 3N6.

## 1. Introduction

Various aspects of illegal immigration into the United States have been the subject of a lively public debate over the last few years. However, with the exception of the pioneering work of Ethier (1984), the problem of illegal migration has been largely neglected in the theoretical literature. The purpose of the present study is to fill in some of the existing gaps by analysing a number of issues which are related to the recent policy debate.

At the heart of this debate is the claim that the presence of illegal aliens has an adverse effect on the employment opportunities of the native workers. Thus, one of the objectives of this paper is to highlight the link between illegal immigration and unemployment. It is assumed that the cause of unemployment, both in the host and in the source country, is a binding minimum wage. Following Bhagwati and Hamada (1974), Hamada and Bhagwati (1975), and Rodríguez (1975), the problem of international migration in the presence of unemployment is examined within the framework suggested by Harris and Todaro (1970).

It is also the intent of the present study to analyse some of the dynamic aspects of immigration policy. The level of enforcement of existing immigration restrictions in the United States, for example, has varied from time to time in response to lobbying efforts expended by various interest groups in favor of or against tighter controls. An attempt is made below to model this phenomenon in an extremely simple fashion, drawing to some extent on the approach developed by Brock and Magee (1978) and Findlay and Wellisz (1982) in their analyses of endogenous tariff formation.

The remainder of the paper is organized as follows. Section 2 develops a dynamic two-country model of illegal migration. Immigration policy of the host country is assumed to be determined by the economy's unemployment rate and by its stock of migrant labor. The latter, in turn, adjusts in response to changes in the relative attractiveness of illegal migration. Section 3 studies the short- and long-run effects of various disturbances on the rates of unemployment in the two economies, on the stock of migrant labor, and on the level of spending by the host country on the enforcement of its immigration restrictions. Disturbances which are considered include a decline in the demand for labor in the source country, a cut in the minimum wage of the host country, an increase in the degree of job discrimination against migrant workers, and an increase in the capital endowment of the host country. Finally, Section 4 concludes the paper by summarizing the main results and offering suggestions for further research.

## 2. A Simple Two-Country Model

Consider a world consisting of two economies, both engaged in the production of a single homogeneous commodity. Output is produced with the aid of capital and labor according to a linear homogeneous production function (not necessarily identical in the two countries). Adopting the terminology introduced by Ramaswami (1968), let us call the capital-abundant country Mancunia (M) and the labor-abundant country Agraria (A).

While capital is assumed to be immobile across international borders, there exists the possibility for workers to migrate from one economy to the other. However, let us suppose that immigration into the capital-abundant country (M) is prohibited by law, giving rise to illegal migration. The extent to which illegal migration does occur depends on, among other factors, the degree to which the government of M enforces its ban on immigration.

Let us further assume that the labor markets of the two countries are subject to a binding minimum wage. This wage is set in real terms at  $\bar{w}_a$  and  $\bar{w}_m$  in A and M, respectively.<sup>1</sup> Following Harris and Todaro (1970), we shall posit that the job-selection process in both economies is random. Thus, on any given day, each native worker of country  $i(i=a, m)$  faces the same probability  $\pi_i$  of finding a job in his home country. This probability is equal to the number of jobs available in country  $i$  at the prevailing minimum wage, divided by the size of that economy's labor force.

For the native workers of each economy, the expected wage is then given by  $\bar{w}_a\pi_a$  and  $\bar{w}_m\pi_m$  in A and M, respectively. However, migrant workers seeking employment in M face an expected wage of only  $(1-\delta)\bar{w}_m\pi_m$ , where  $\delta$  measures the percentage by which a migrant's expected income falls short of that received by a native worker due to the difference in their legal status. The value of  $\delta$  is determined by the level of costs that a typical migrant chooses to incur in an attempt to pass himself as a legal resident, as well as by the joint probability that, in spite of these expenditures, his immigration status would be revealed and that this revelation would entail loss of employment. This joint probability depends, in turn, on the degree to which illegal aliens can be distinguished from native workers and the extent to which employers in M care to distinguish between the two. The latter is primarily influenced by the penalties employers face when convicted of knowingly hiring illegal aliens. An interesting analysis of the process which determines the equilibrium value of  $\delta$  can be found in the paper by Ethier (1984). However, in order to sharpen the focus of our analysis on border enforcement rather than internal immigration controls, I shall assume in what follows that  $\delta$  is exogenously given.

The expected wage faced by citizens of A in countries A and M is therefore equal to  $\bar{w}_a \pi_a$  and  $(1-\delta)\bar{w}_m \pi_m$ , respectively. Let us assume that the migrants are risk neutral and that the wage-equivalent of the cost of illegal migration is given by  $c$ . The value of  $c$  may be viewed as the cost of moving illegally across the international border divided by the length of time that the migrant expects to stay abroad.<sup>2</sup>

In deciding whether or not to migrate, each citizen of A will compare the daily benefit from being located in country M,  $(1-\delta)\bar{w}_m \pi_m - \bar{w}_a \pi_a$ , with the cost,  $c$ . We shall assume that if the opportunities abroad (at home) are relatively more attractive, the stock of migrant labor residing in M, denoted by  $\lambda$ , will tend to rise (fall). That is

$$\dot{\lambda} = \theta[(1-\delta)\bar{w}_m \pi_m - \bar{w}_a \pi_a - c], \quad (1)$$

where  $\dot{\lambda} = d\lambda/dt$ ,  $\theta[0] = 0$ , and  $\theta'[\cdot] > 0$ .

Let us consider next the determinants of  $\pi_a$  and  $\pi_m$ . The number of jobs available in country  $i$ ,  $J_i$ , is a direct function of the economy's capital endowment and an inverse function of the prevailing minimum wage. On the other hand, the size of the labor force in countries A and M is given by  $L_a - \lambda$  and  $L_m + \lambda$ , respectively, where  $L_i$  is the constant number of native workers (or citizens) of country  $i$ . Thus,

$$\pi_a \equiv \frac{J_a(K_a, \bar{w}_a)}{L_a - \lambda} = \alpha(\lambda; \bar{w}_a, L_a, K_a), \quad \alpha_1, \alpha_4 > 0, \alpha_2, \alpha_3 < 0, \quad (2)$$

$$\pi_m \equiv \frac{J_m(K_m, \bar{w}_m)}{L_m + \lambda} = \mu(\lambda; \bar{w}_m, L_m, K_m), \quad \mu_1, \mu_2, \mu_3 < 0, \mu_4 > 0, \quad (3)$$

where  $K_a$  and  $K_m$  are the fixed capital endowments of countries A and M.

Turning our attention to  $c$ , the psychic and economic cost of illegal migration, we shall assume that it depends only on the flow of real expenditure,  $E$ , earmarked by country M for enforcement of its ban on immigration.

$$c = c(E), \quad c'(\cdot) > 0. \quad (4)$$

Since the native workers of M realize that each job held by a migrant is one less job available to the legal residents, they will naturally attempt to persuade their government to raise the degree of enforcement of immigration restrictions. How effective these lobbying efforts are in raising, or just maintaining the government's target rate of enforcement spending,  $\tilde{E}$ , is assumed to be a direct function of  $\lambda$ , the existing stock of migrant labor in M, and of  $1-\pi_m$ , the rate of unemployment among the native workers.

$$\tilde{E} = \tilde{E}(\lambda, 1-\pi_m), \quad \tilde{E}_1, \tilde{E}_2 > 0. \quad (5)$$

The argument  $\lambda$  is intended to capture the influence on immigration policy of social and political frictions which emerge as the ratio of migrants to native residents becomes large.<sup>3</sup> The second argument reflects the presumed positive relationship between the incidence of unemployment among the native workers and the willingness of the government to expend resources on the enforcement of immigration restrictions.

Due to the existence of bureaucratic lags, however, it is assumed that the target rate of enforcement spending cannot be implemented immediately. Instead, enforcement spending is posited to adjust over time at a rate proportional to the gap between the target and the actual rate of enforcement spending. That is,  $\dot{E} = \epsilon[\tilde{E}(\lambda, 1-\pi_m) - E]$ , where  $\epsilon$  is a positive constant. By sub-

stituting eq. (3) into the expression for  $\dot{E}$ , we obtain

$$\dot{E} = \epsilon\{\tilde{E}[\lambda, 1-\mu(\lambda; \bar{w}_m, L_m, K_m)] - E\} \quad (6)$$

Similarly,  $\dot{\lambda}$  may also be expressed as a function of  $\lambda$ ,  $E$ , and the exogenous variables. By using eqs. (2)-(4) in (1), we have

$$\dot{\lambda} = \theta[(1-\delta)\bar{w}_m\mu(\lambda; \bar{w}_m, L_m, K_m) - \bar{w}_a\alpha(\lambda; \bar{w}_a, L_a, K_a) - c(E)]. \quad (7)$$

Eqs. (6)-(7) govern the dynamics of adjustment when the two economies are out of equilibrium. These eqs. enable us to solve for the time paths of  $\lambda$  and  $E$ , which may then be used in eqs. (2)-(5) to study the behavior of the remaining endogenous variables.

A graphic solution of the system (6)-(7) is presented in fig. 1. In examining this solution, let us begin by analysing the slope of the  $\dot{E} = 0$  schedule. An increase in  $\lambda$  raises the target rate of enforcement spending both directly, and indirectly by raising the rate of unemployment among the native workers of M. This exerts upward pressures on  $E$ . On the other hand, a higher  $E$  reduces these same pressures. Thus, the  $\dot{E} = 0$  schedule is positively sloped.

Turning to the  $\dot{\lambda} = 0$  locus, we note that an increase in  $\lambda$  lowers the expected wage in M and raises it in A. For citizens of A, this reduces the attractiveness of international migration, resulting in a tendency for  $\lambda$  to fall. Because a decline in  $E$  operates in the opposite direction by lowering the cost of illegal migration, the  $\dot{\lambda} = 0$  schedule is negatively sloped.

The point of intersection between the two schedules determines the stationary values of  $\lambda$  and  $E$ . Arrows in the figure indicate the directions in which  $\lambda$  and  $E$  travel over time when the system is in disequili-

brium. It can easily be ascertained that the system is stable, although the possibility of cyclical adjustment cannot be ruled out.<sup>4</sup>

### 3. Long- and Short-Run Effects of Disturbances

Consider next the effects of changes in some of the exogenous variables of the model on the stock of migrant labor, the rate of enforcement spending, and the probability of finding a job in each of the two economies.

#### 3.1 A Decline in the Demand for Labor in the Source Country

Since the recent waves of illegal immigration into the U.S. may be primarily attributed to the deterioration in the economic and social conditions in the countries of emigration, let us begin by examining the consequences of a drop in the demand for labor in country A. This can be conveniently represented by a decline in  $K_a$ . As indicated by eqs. (6)-(7), a reduction in  $K_a$  leaves the position of the  $\dot{E} = 0$  schedule unaffected, while it shifts the  $\dot{\lambda} = 0$  schedule up and to the right. This upward shift of the  $\dot{\lambda} = 0$  locus reflects the requirement that  $E$  be higher at each value of  $\lambda$ , so as to offset the effect of a decline in employment opportunities in country A on the relative attractiveness of illegal migration.

In the new steady state, represented by point Y in fig. 2, the values of both  $\lambda$  and  $E$  are higher. The rise in  $\lambda$  implies that  $\pi_m$ , the probability of finding a job in M, falls. This lowers the expected real income of native workers in M, indicating that changes in the conditions in the labor market of the source country are transmitted to some extent to the labor market of the host country. Accompanying the rise in  $\lambda$  and the decline in  $\pi_m$  is an increase in the stationary rate of enforcement spending, reflecting greater pressures within country M to keep the migrants out. As a result, the stationary value of  $c$  is also higher. Moreover, because  $(1-\delta)\bar{w}_m\pi_m$  must be equal in the long run to  $\bar{w}_a\pi_a + c(E)$ , we may infer that

the proportional decline in  $\pi_a$  exceeds that of  $\pi_m$ .

Thus, in the presence of international migration, disturbances to the labor market of the source country are transmitted in the long run to that of the host country. The existence of moving costs and endogenous immigration barriers, however, serves to diminish the degree of transmission. As may be seen in eq. (A5) of the Appendix, the degree of transmission is inversely related to  $\eta_1$  and  $\eta_2$ , the elasticities of the target rate of enforcement spending with respect to  $\lambda$  and  $1-\pi_m$ , respectively. In the limit, as either  $\eta_1$  or  $\eta_2 \rightarrow \infty$ , the  $\dot{E} = 0$  schedule becomes vertical and the labor market of the host country is completely insulated in the long run from any disturbances which may occur in the source country. In the short run, however, total insulation requires, in addition, that the speed of adjustment in the rate of enforcement spending be infinite.

In general, the dynamics of unemployment in the two economies are governed by the speeds of adjustment in both  $E$  and  $\lambda$ . For illustrative purposes, two qualitatively distinct adjustment paths, labelled I and II, are depicted in fig. 2. Path I (II) corresponds to the case in which the speed of adjustment in the stock of migrant labor is high (low) in relation to the speed at which the rate of enforcement spending changes in response to movements in  $\tilde{E}$ . Since country M's unemployment rate is directly related to  $\lambda$ , it can be seen in the figure that if enforcement spending adjusts relatively slowly, giving rise to path I, the unemployment rate in M will reach levels during the transition period which are in excess of its stationary value. In contrast, along this same path, the unemployment rate of country A falls below its long-run level since  $1-\pi_a$  is inversely related to  $\lambda$ . Alternatively, if the enforcement budget of the immigration authorities adjusts relatively quickly, the transition process may be depicted by the path labelled

II. In that case the unemployment rate in country M (A) rises (falls) monotonically as the system travels from point X to point Y.

### 3.2 A Decline in the Minimum Wage of the Host Country

Let us turn our attention to the effects of a decline in  $\bar{w}_m$ . The exercise is particularly relevant since a move in this direction has received considerable support from the current U.S. administration.

If the demand for labor in country M is elastic, a reduction in  $\bar{w}_m$  raises the expected wage in that economy at each value of  $\lambda$ , shifting the  $\dot{\lambda}=0$  schedule to the right. Moreover, by lowering the unemployment rate, the cut in  $\bar{w}_m$  also reduces  $\tilde{E}$  for any given  $\lambda$ , shifting the  $\dot{E}=0$  schedule down and to the right. Accordingly, the stationary value of  $\lambda$  must rise. The effect on  $E$ , however, is ambiguous. As illustrated in fig. 3, if the shift to the right of the  $\dot{\lambda}=0$  schedule is larger (smaller) than that of the  $\dot{E}=0$  locus, the long-run value of  $E$  is higher (lower).

The magnitude of the rightward shift of the  $\dot{\lambda}=0$  schedule is directly related to  $\eta_{Jm}$ , the elasticity of demand for labor in M, while that of the  $\dot{E}=0$  schedule is not only a direct function of  $\eta_{Jm}$ , but also of  $\eta_2/\eta_1$ . This ratio is the elasticity of the target rate of enforcement spending with respect to the unemployment rate divided by its elasticity with respect to  $\lambda$ . Thus, the greater the sensitivity of immigration policy to unemployment in relation to its sensitivity to the stock of migrant labor, the larger the shift of the  $\dot{E}=0$  locus. Accordingly, high (low) values of  $\eta_2/\eta_1$  in relation to  $\eta_{Jm}$  result in a tendency for the stationary level of  $E$  to fall (rise), as from  $E_0$  to  $E_1(E_2)$  in fig. 3.<sup>5</sup>

Alternatively, if the demand for labor in M is inelastic, both schedules shift down. The stationary value of  $E$  then declines, reflecting a

tendency for both the unemployment rate and the stock of migrant labor to fall at the initial level of  $E$ . The long-run effect on  $\lambda$ , however, may be either positive or negative, depending on whether the downward shift of the  $\dot{E} = 0$  schedule is larger or smaller than that of the  $\dot{\lambda} = 0$  locus. As shown in eq. (A9) of the Appendix, in the presence of inelastic demand for labor (i.e.,  $\eta_{Jm} < 1$ ), the possibility of an increase in  $\lambda$  emerges only if both  $\eta_2$  and  $\eta_{cE}$  are relatively large ( $\eta_{cE}$  is the elasticity of the cost of illegal migration with respect to  $E$ ). In this case, at  $\lambda = \lambda_0$ , the adverse effect of the fall in the expected wage in country M on the attractiveness of illegal migration is outweighed by the favorable effect of the decline in enforcement spending. Thus, in figure 3, the stationary value of  $\lambda$  rises from  $\lambda_0$  to  $\lambda_3$ . Alternatively, if  $\eta_2$  and  $\eta_{cE}$  are relatively low,  $\lambda$  falls from  $\lambda_0$  to, say,  $\lambda_4$ .

In summary, if  $\eta_{Jm} > 1$ , a cut in  $\bar{w}_m$  raises  $\lambda$  and may either lower or increase  $E$ , depending on whether the associated decline in unemployment or the increase in the stock of migrant labor has a greater influence on the target rate of enforcement spending. Alternatively, if  $\eta_{Jm} < 1$ ,  $E$  necessarily falls as country M experiences both a reduction in the rate of unemployment and a tendency for  $\lambda$  to decline at the initial value of  $E$ . However, as argued in the previous paragraph, the stock of migrant labor may either rise or fall. This latter result implies that the effect of a cut in  $\bar{w}_m$  on the expected wage in country A is also ambiguous. The value of  $\bar{w}_a \pi_a$  increases if  $\eta_{Jm} > 1$ , but it may either rise or fall if  $\eta_{Jm} < 1$ . Consequently, with inelastic demand for labor in M, it is possible for a decline in  $\bar{w}_m$  to raise  $\bar{w}_a \pi_a$  while lowering  $\bar{w}_m \pi_m$ . In this case the policy improves the welfare of workers who are citizens of A and reduces the expected wage of those who are citizens of M. What makes this paradoxical result possible, is the change in immigration policy of country M in response to the fall in unemployment.

With respect to the dynamics of adjustment, it is interesting to note that, regardless of whether  $E$  is higher or lower in the long run, there is a tendency for  $E$  to fall during the initial phase of adjustment. This tendency emerges as the decline in the unemployment rate of country  $M$  removes some of the pressure to maintain the level of enforcement spending. Consequently, the short-run effect on  $E$  may be the opposite of the long-run effect. In the case of  $\lambda$ , however, initial movement is always in the direction of the long-run equilibrium.

### 3.3 An Increase in the Capital Endowment of the Host Country

Consider next the consequences of an increase in  $K_m$ . By creating new job opportunities in country  $M$ , this raises  $\pi_m$  at each value of  $\lambda$ . Thus, as illustrated in fig. 4, both schedules shift to the right, giving rise to an increase in the stationary stock of migrant labor. The effect on the stationary value of  $E$ , however, is ambiguous. It is shown in eq. (A6) of the Appendix that  $E$  rises or falls depending on whether  $\eta_1/\eta_2 \gtrless [\pi_m/(1-\pi_m)][\gamma\lambda/(L_a-\lambda)]$ . A relatively high value of  $\eta_1/\eta_2$  reflects a strong tendency for  $\tilde{E}$  to rise in response to an increase in  $\lambda$  and a weak tendency for it to fall in response to a decline in the unemployment rate. The rightward shift of the  $\dot{E} = 0$  schedule is then small in relation to that of the  $\dot{\lambda} = 0$  locus, resulting in an increase in the stationary value of  $E$  from, say,  $E_0$  to  $E_1$  in fig. 4. Alternatively, if  $\eta_1/\eta_2$  is relatively small,  $E$  declines in the long run to, say,  $E_2$ .

If the stationary value of  $E$  falls, it can be shown that the ratio of  $\pi_a$  to  $\pi_m$  must necessarily increase. In this case, a rise in the capital endowment of country  $M$  improves the expected wage of the native workers of  $A$  proportionately more than that of the native workers of  $M$ . How is

this possible? With the level of spending on enforcement of immigration restrictions in country M tied to the rate of unemployment among the native workers, there exists the possibility that the long-run value of  $E$  may fall, reducing the cost of illegal immigration. Since in a stationary equilibrium  $c(E) = (1-\delta)\bar{w}_m\pi_m - \bar{w}_a\pi_a$ , we may conclude that a rise in  $K_m$ , which leads to an increase in  $(1-\delta)\bar{w}_m\pi_m$ , must be accompanied by an even larger increase in  $\bar{w}_a\pi_a$ . Moreover, since  $\delta$ ,  $\bar{w}_m$ , and  $\bar{w}_a$  are constant, it follows that  $(1-\delta)\bar{w}_m d\pi_m < \bar{w}_a d\pi_a$ . This inequality may be written as  $\hat{\pi}_a > [(1-\delta)\bar{w}_m\pi_m/\bar{w}_a\pi_a]\hat{\pi}_m$ , where a " $\hat{\cdot}$ " over a variable indicates its proportional change. Because  $(1-\delta)\bar{w}_m\pi_m/\bar{w}_a\pi_a > 1$ , it immediately follows that  $\hat{\pi}_a > \hat{\pi}_m$ . Furthermore, even if the stationary value of  $E$  increases,  $\hat{\pi}_a > \hat{\pi}_m$  provided that  $\hat{\pi}_a > \eta_{cE}\hat{E}$ , where  $\eta_{cE}$  is the elasticity of  $c$  with respect to  $E$ .

Turning to the short-run effects of an increase in  $K_m$ , we note that adjustment to this disturbance is qualitatively similar to that associated with a reduction in  $\bar{w}_m$  in the presence of elastic demand for labor. That is, the initial fall in  $E$  may be followed by a tendency for  $E$  to rise, possibly above its original level. On the other hand, the stock of migrant labor will initially rise, perhaps reaching levels along the adjustment path which are in excess of the stationary value. Thus the decline in the unemployment rate of country A may be even greater along the transition path than it is in the long run.

### 3.4 An Increase in the Degree of Discrimination Against Migrants

Finally, let us examine the long-run effects of an increase in  $\delta$ , the parameter that measures the extent to which migrant workers experience job discrimination within country M. This rise in  $\delta$  may reflect, for example, an increase in the penalties that employers face if convicted of

hiring illegal aliens.

An increase in  $\delta$  shifts the  $\dot{\lambda} = 0$  schedule to the left, leaving the position of the  $\dot{E} = 0$  schedule unaffected. The stationary values of both  $\lambda$  and  $E$  must therefore decline. The fall in  $\lambda$  implies that the expected wage facing the native workers in  $M$  is higher while the one facing the native workers in  $A$  is lower. Moreover, by raising  $\delta$ , which may be viewed as an "internal" barrier to international migration, country  $M$  is able to economize on its efforts to maintain "external" barriers.<sup>6</sup> This is reflected in a lower value of  $E$ . Nonetheless, the joint influence of both internal and external impediments to international migration is greater in the new steady state; only in that case is it possible for  $\pi_m$  to rise and  $\pi_a$  to fall.

#### 4. Conclusions

This paper has developed a simple two-country model of illegal migration in an attempt to study the interaction among variables such as the stock of migrant labor, the rates of unemployment in the two economies, and the rate of spending by the host country on the enforcement of its immigration restrictions. It was postulated that the rate of enforcement spending varies in response to changes in the labor-market conditions of the host country. Both a higher stock of migrant labor and a higher rate of unemployment among the native workers were assumed to exert upward pressures on the rate of enforcement spending. On the other hand, the stock of migrant labor was assumed to adjust in response to discrepancies between the labor-market conditions faced by potential migrants in the two economies.

It was found that disturbances to the labor market of the source country

(A) are transmitted to that of the host country (M), although the presence of moving costs and endogenous immigration barriers serves to reduce the degree of transmission. In the long run, the extent to which a decline in the demand for labor in A raises unemployment in M, was shown to be inversely related to the sensitivity of immigration policy in M to changes in the stock of migrant labor and in the unemployment rate among the native workers. The greater the willingness of the immigration authorities to incur higher enforcement costs in order to prevent these two variables from rising, the lower the degree of transmission. In the short run, however, it is the speed of adjustment in the rate of enforcement spending in relation to the speed of adjustment in the stock of migrant labor that determines the path of unemployment in the two economies.

In studying the effects of a decline in the minimum wage of the host country, we considered two distinct possibilities. First, if the demand for labor is elastic, the expected wage in M rises, attracting a larger number of migrants. However, the rate of enforcement spending may either rise or fall, depending primarily on the sensitivity of immigration policy to an increase in the number of migrants relative to its sensitivity to a decline in the unemployment rate among the native workers. Alternatively, if the demand for labor is inelastic, enforcement spending necessarily declines as the cut in the minimum wage lowers the unemployment rate within the economy and simultaneously reduces the attractiveness of illegal migration at the original level of enforcement spending. The effect on the stock of migrant labor, however, is ambiguous. It was shown that if the reduction in enforcement spending has a greater influence on the decision to migrate than does the fall in the expected host-country wage, the stock of migrant labor will

rise. Under those conditions, a cut in the minimum wage of the host country lowers the expected wage of its native workers while increasing the welfare of all workers who are citizens of the source country.

It was also shown that capital accumulation in the host country may lead to a greater increase in the probability of finding a job in the source country than in the host country itself. This result emerges if the rate of enforcement spending declines, but may also arise, under certain conditions, if enforcement spending increases. Moreover, the improvement in labor-market conditions of the source country may be even greater in the short run than that in the long run.

The analysis of this paper could be extended in several directions. It would be interesting, for example, to model explicitly the costs and benefits of lobbying in favor of or against immigration restrictions. This would enable one to examine, within a much richer setting, the interaction between the institutions responsible for the formulation of immigration policy, and the lobbying efforts of various interest groups.

It would also be useful to allow for international capital movements within a model of illegal migration. Capital outflows from the host country may be extremely effective in controlling the inflow of illegal aliens, particularly if investments abroad are directed to the areas near the border. As argued by Bhagwati (1985), creation of such an "economic fence", along with an increase in efforts to control entry at the border, seems to be the most sensible way of dealing with the problem of illegal immigration.

### Appendix

This Appendix derives the comparative statics results that were presented in Section 3. By setting eqs. (6)-(7) equal to zero, we obtain

$$E = \tilde{E}[\lambda, 1-\mu(\lambda; \bar{w}_m, L_m, K_m)], \quad (A1)$$

$$(1-\delta)\bar{w}_m\mu(\lambda; \bar{w}_m, L_m, K_m) = \bar{w}_a\alpha(\lambda; \bar{w}_a, L_a, K_a) + c(E), \quad (A2)$$

where  $\mu(\cdot) = J_m(K_m, \bar{w}_m)/(L_m + \lambda)$  and  $\alpha(\cdot) = J_a(K_a, \bar{w}_a)/(L_a - \lambda)$ . Total differentiation of (A1)-(A2) yields

$$\begin{vmatrix} \left( \eta_1 + \eta_2 \left( \frac{\pi_m}{1-\pi_m} \right) \left( \frac{\lambda}{L_m + \lambda} \right) \right) & -1 \\ \lambda \left( \frac{1}{L_m + \lambda} + \frac{\gamma}{L_a - \lambda} \right) & (1-\gamma)\eta_{cE} \end{vmatrix} \begin{vmatrix} \hat{\lambda} \\ \hat{E} \end{vmatrix} = \begin{vmatrix} -\eta_2 \left( \frac{\pi_m}{1-\pi_m} \right) \eta_{Jm} \hat{\bar{w}}_m + \eta_2 \left( \frac{\pi_m}{1-\pi_m} \right) \hat{K}_m \\ (1-\eta_{Jm})\hat{\bar{w}}_m + \hat{K}_m - (1-\eta_{Ja})\gamma\hat{\bar{w}}_a - \gamma\hat{K}_a - \frac{d\delta}{1-\delta} \end{vmatrix}. \quad (A3)$$

where  $\eta_1 \equiv [\partial \tilde{E}(\cdot)/\partial \lambda][\lambda/\tilde{E}(\cdot)]$ ,  $\eta_2 \equiv [\partial \tilde{E}(\cdot)/\partial (1-\pi_m)][(1-\pi_m)/\tilde{E}(\cdot)]$ ,

$\eta_{cE} = [dc(\cdot)/dE][E/c(\cdot)] > 0$ ,  $\eta_{Ji} \equiv -[\partial J_i(\cdot)/\partial \bar{w}_i][\bar{w}_i/J_i(\cdot)] > 0$

$i = a, m$ , and  $\gamma \equiv \bar{w}_a\pi_a/(1-\delta)\bar{w}_m\pi_m < 1$ . Solving the system (A3), we obtain

$$\frac{\hat{E}}{\hat{K}_a} = -\gamma \left( \eta_1 + \eta_2 \left( \frac{\pi_m}{1-\pi_m} \right) \left( \frac{\lambda}{L_m + \lambda} \right) \right) / \Delta < 0, \quad (A4)$$

$$\frac{\hat{\lambda}}{\hat{K}_a} = -\gamma / \Delta < 0, \quad (A5)$$

$$\frac{\hat{E}}{\hat{K}_m} = \left( \eta_1 - \eta_2 \left( \frac{\pi_m}{1-\pi_m} \right) \left( \frac{\lambda}{L_m + \lambda} \right) \right) / \Delta \gtrless 0, \quad (A6)$$

$$\frac{\hat{\lambda}}{\hat{K}_m} = \left( 1 + (1-\gamma)\eta_{cE}\eta_2\left(\frac{\pi_m}{1-\pi_m}\right) \right) / \Delta > 0, \quad (A7)$$

$$\frac{\hat{E}}{\hat{w}_m} = \left( (1 - \eta_{Jm})\eta_1 + \eta_2\left(\frac{\pi_m}{1-\pi_m}\right)\left(\frac{\lambda}{L_m+\lambda} + \frac{\gamma\lambda\eta_{Jm}}{L_a-\lambda}\right) \right) / \Delta \stackrel{\geq}{<} 0, \quad (A8)$$

$$\frac{\hat{\lambda}}{\hat{w}_m} = \left( 1 - \eta_{Jm} - (1-\gamma)\eta_{cE}\eta_2\eta_{Jm}\left(\frac{\pi_m}{1-\pi_m}\right) \right) / \Delta \stackrel{\geq}{<} 0 \quad (A9)$$

$$\frac{\hat{E}}{\hat{w}_a} = -\gamma(1-\eta_{Ja})\left(\eta_1 + \eta_2\left(\frac{\pi_m}{1-\pi_m}\right)\left(\frac{\lambda}{L_m+\lambda}\right)\right) / \Delta \stackrel{\geq}{<} 0 \quad \text{as} \quad \eta_{Ja} \stackrel{\geq}{<} 1, \quad (A10)$$

$$\frac{\hat{\lambda}}{\hat{w}_a} = -\gamma(1-\eta_{Ja}) / \Delta \stackrel{\geq}{<} 0 \quad \text{as} \quad \eta_{Ja} \stackrel{\geq}{<} 1, \quad (A11)$$

$$\frac{\hat{E}}{d\delta/(1-\delta)} = -\left(\eta_1 + \eta_2\left(\frac{\pi_m}{1-\pi_m}\right)\left(\frac{\lambda}{L_m+\lambda}\right)\right) / \Delta < 0, \quad (A12)$$

$$\frac{\hat{\lambda}}{d\delta/(1-\delta)} = -1/\Delta < 0, \quad (A13)$$

where  $\Delta \equiv (1-\gamma)\eta_{cE}\left(\eta_1 + \eta_2\left(\frac{\pi_m}{1-\pi_m}\right)\left(\frac{\lambda}{L_m+\lambda}\right)\right) + \lambda\left(\frac{1}{L_m+\lambda} + \frac{\gamma}{L_a-\lambda}\right) > 0.$

Footnotes

- \* I wish to thank Henryk Kierzkowski, Alan Stockman, and the participants in a seminar at the Graduate Institute for International Studies in Geneva, for helpful comments on an earlier draft of this paper.
1. Alternatively, one may wish to assume that only the labor market of country M is subject to minimum-wage laws. This would merely require that changes in the unemployment rate of country A be referred to in the discussion below as changes in the market wage in the opposite direction.
  2. For simplicity, we shall treat this length of time as being an inverse function of the probability that, on any given day, a typical migrant would be caught inside the country by the immigration authorities and immediately deported.
  3. Some of these frictions and their influence on immigration policy in Germany, for example, have been documented by Mehrländer (1980).
  4. The determinant of the system's adjustment matrix is given by  $\epsilon \theta' [c'(\tilde{E}_1 - \mu_1 \tilde{E}_2) + \bar{w}_a \alpha_1 - (1-\delta)\bar{w}_m \mu_1] > 0$  and its trace by  $\theta' [(1-\delta)\bar{w}_m \mu_1 - \bar{w}_a \alpha_1] - \epsilon < 0$ . Thus, both of the system's characteristic roots have a negative real part. This ensures stability.
  5. As shown in eq. (A8) of the Appendix, the stationary value of E rises in response to a decline in  $\bar{w}_m$  only if  $(\eta_{jm} - 1) > (\eta_2/\eta_1)[\pi_m/(1-\pi_m)][\lambda/(L_m + \lambda) + \eta_{jm}\gamma\lambda/(L_a - \lambda)]$ .
  6. For an analysis of the interaction between "internal" and "external" barriers to international migration, see Ethier (1984).

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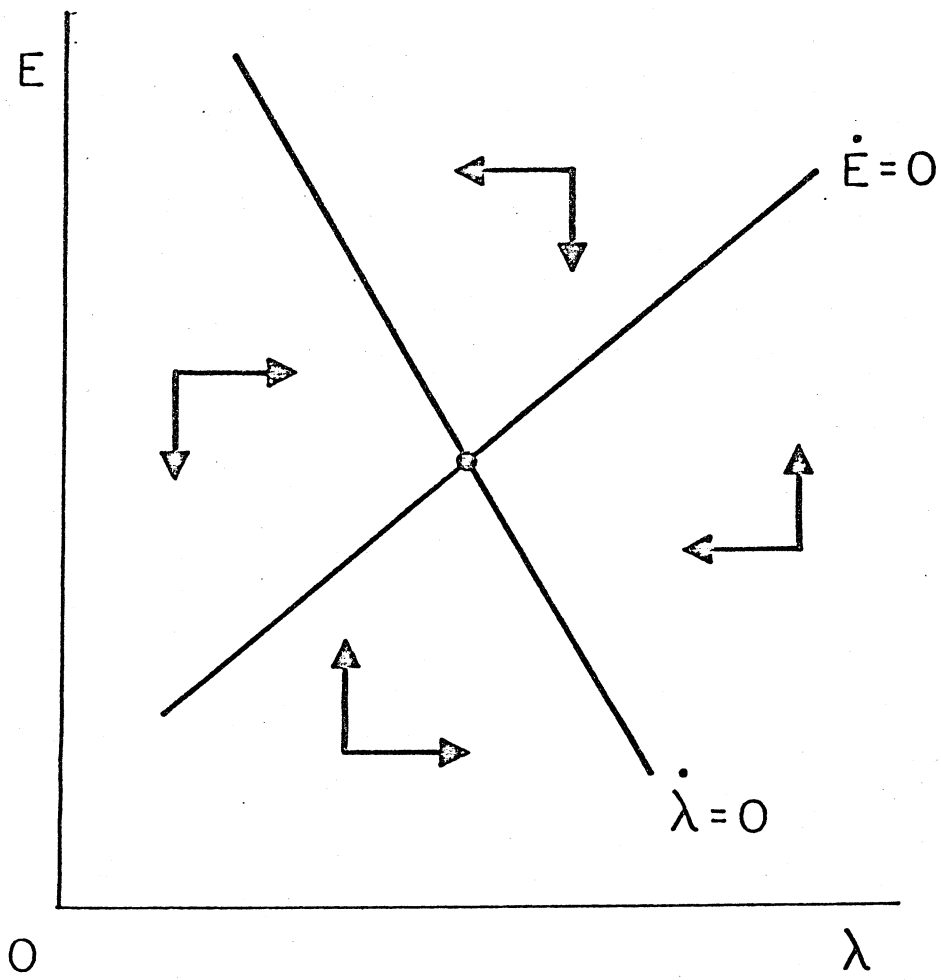


Fig. 1

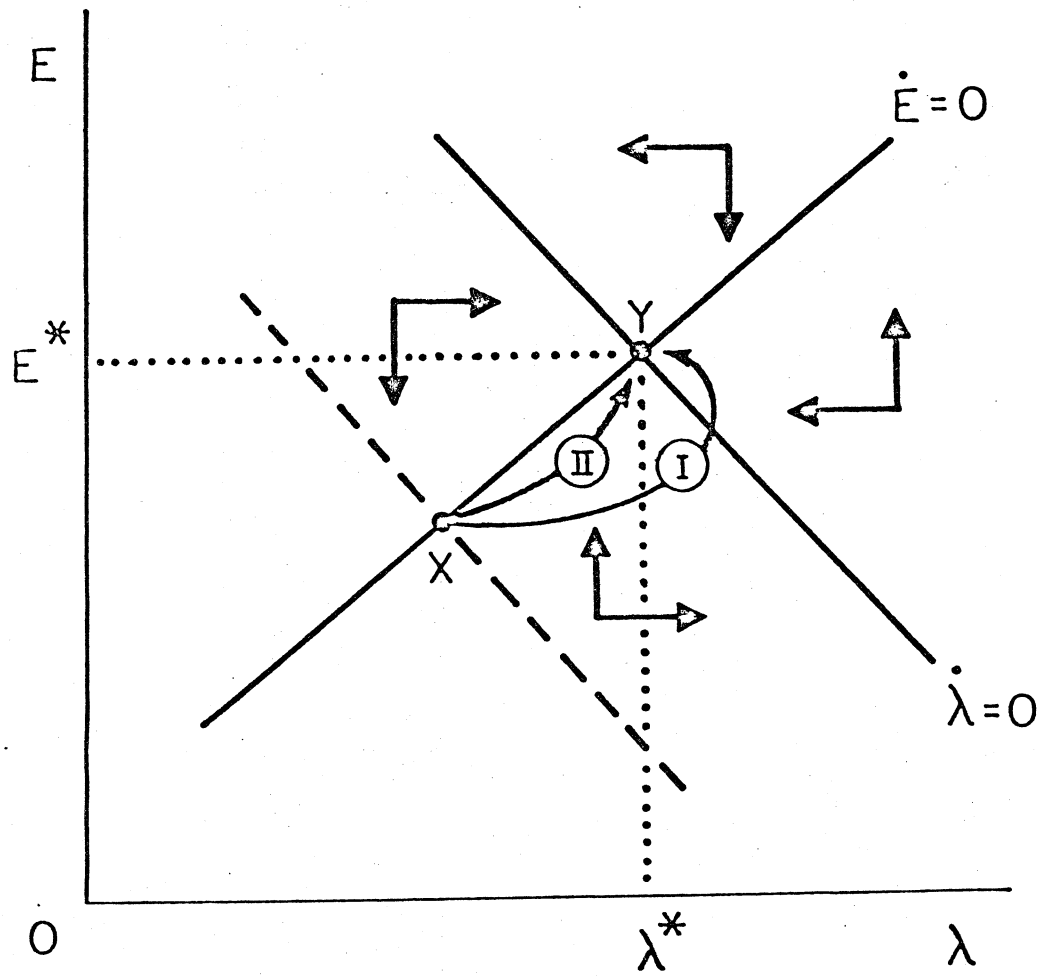


Fig. 2

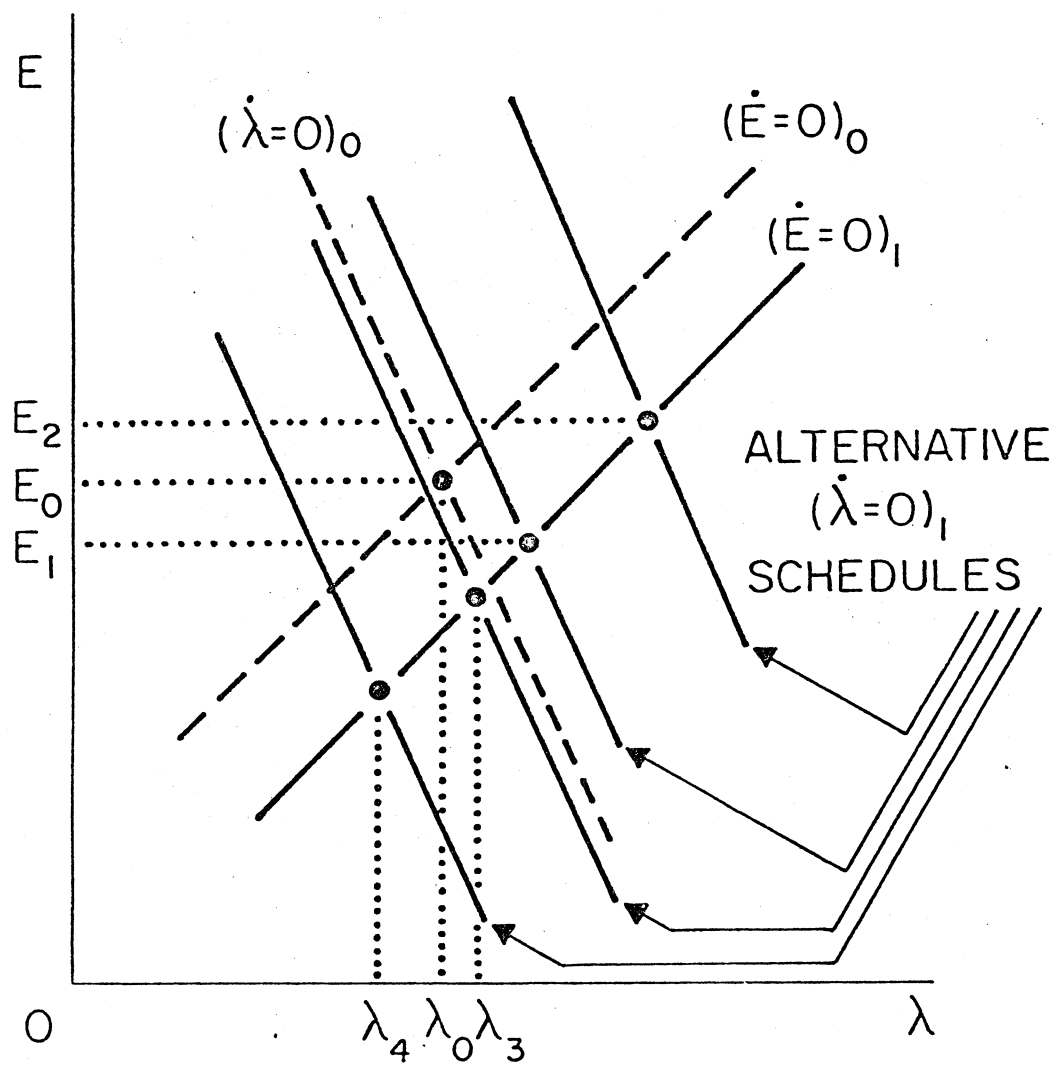


Figure 3

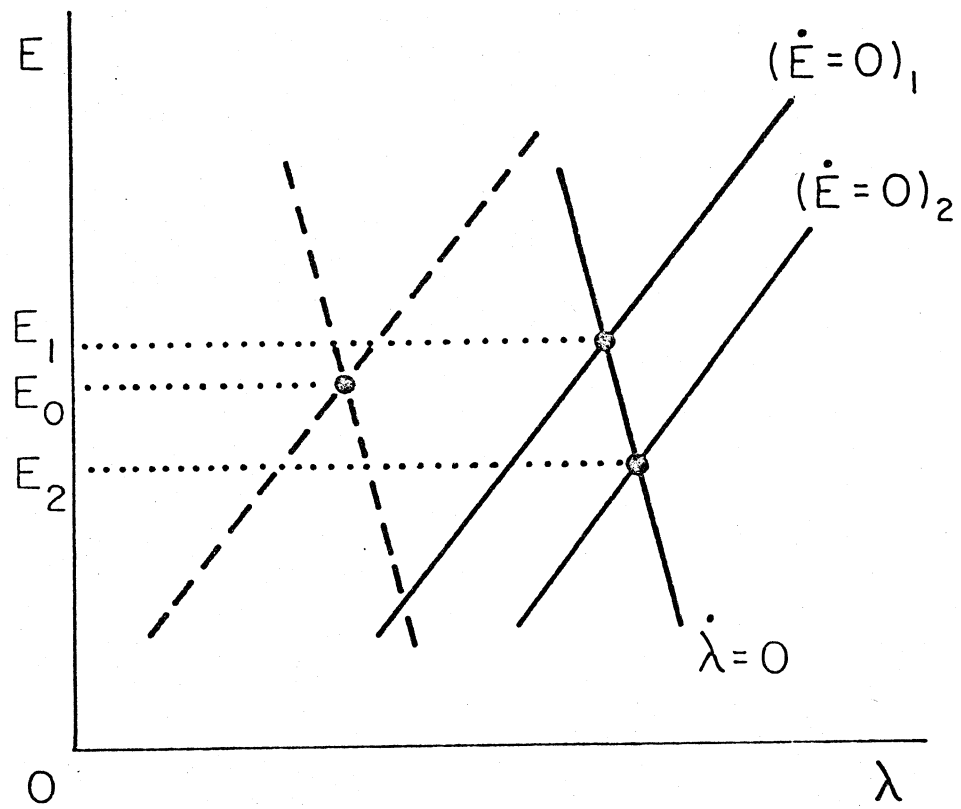


Figure 4

